Reassessing the crater distributions on Ganymede and Callisto: results from Voyager and Galileo, and an outlook to ESA's JUICE mission to Jupiter

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Crater distributions and origin of potential impactors on the Galilean satellites has been an issue of controversial debate. In this work, we review the current knowledge of the cratering record on Ganymede and Callisto and present strategies for further studies using images from ESA's JUICE mission to Jupiter. Crater distributions in densely cratered units on these two satellites show a complex shape between 20 m and 200 km crater diameter, similar to lunar highland distributions implying impacts of members of a collisionally evolved projectile family. Also, the complex shape predominantly indicates production distributions. No evidence for apex-antapex asymmetries in crater frequency was found, therefore the majority of projectiles (a) preferentially impacted from planetocentric orbits, or (b) the satellites were rotating non-synchronously during a time of heavy bombardment. The currently available imaging data are insufficient to investigate in detail significant changes in the shape of crater distributions with time. Clusters of secondary craters are well mappable and excluded from crater counts, lack of sufficient image coverage at high resolution, however, in many cases impedes the identification of source craters. ESA's future JUICE mission will study Ganymede as the first icy satellite in the outer Solar system from an orbit under stable viewing conditions. Measurements of crater distributions can be carried out based on global geologic mapping at highest spatial resolutions (10s of meters down to 3 m/pxl).